JOHNS-MANVILLE

JM

PRODUCTS

JOHNS-MANVILLE SERVICE to INDUSTRY

For 75 years Johns-Manville has pioneered in the research and development of products designed to eliminate industrial waste, reduce maintenance expense, and provide permanent, fireproof building materials for the protection of costly investments.

A number of the more important of these products are described in this catalogue. Further details—and the technical assistance of our Sales Engineers—are available to you at each of our branch offices.

Johns-Manville

Offices In All Large Cities

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OTHER JOHNS-MANVILLE PRODUCTS

The following Johns-Manville products are not listed in this catalogue. For information concerning them, send for the publications indicated.

MATERIALS	PUBLICATIONS
Asbestos Textiles, Papers and Fibres	*Data Sheets TX-1 to 4*
Asbestos Wainscoting	*Form WT-3A*
Celite for Concrete, Mortars and Asphalts	*Forms CC-1A and CC-4A*
Filter-Aids and Mineral Fillers	*Data Sheets FI-1 to 500*
Home Insulation	*Form HI-18A*
Insulating Board	*Form IB-7A*
Sound Control	*Forms AC-9A and AC-11A*

SIXTY J-M OFFICES AT YOUR SERVICE

At each of the offices named below you will find representatives fully qualified to answer any questions about Johns-Manville products, and to assist you in problems where J-M Materials can be of service.

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JOHNS-MANVILLE SHEET, BRICK AND BLOCK INSULATION FOR HEATED SURFACES

Johns-Manville provides insulating materials for use throughout the entire range of industrial process temperatures. The more important of these products are briefly described in the following pages.

Sil-O-Cel Insulating Brick—Three types of Sil-O-Cel Insulating Brick are available: Sil-O-Cel Super Brick (calcined) for temperatures as high as 2500 deg. F., Sil-O-Cel C-22 Brick (calcined) for temperatures to 2000 deg. F., and Sil-O-Cel Natural Brick for temperatures to 1600 deg. F. Sil-O-Cel Brick are ordinarily used behind fire brick in boilers, still furnaces, heat treating furnaces, kilns and other high temperature equipment. Sil-O-Cel Super Brick and Sil-O-Cel C-22 Brick are often used without fire brick protection as an inner lining in high temperature flues and in electrically heated and muffle type furnaces.

All types of Sil-O-Cel Brick are furnished in standard fire brick size, 9x4½x2½ in., and as No. 1 and No. 2 arch brick. Sil-O-Cel Natural Brick are also supplied in 1¼, 2 and 3-in. thicknesses. Sil-O-Cel C-22 Brick are also supplied 3 in. thick. Packed in fibre cartons of 25, 2½-in. brick or an equivalent volume of other sizes. Special mortar shipped for laying.

Superex Blocks—Diatomaceous silica and asbestos fibre, bonded together. Highly efficient for insulating boiler walls, furnaces, etc. Temperature limit, 1600 deg. F. Furnished in blocks 3x18 in. and 6x36 in., flat or curved, in thicknesses of 1 to 4 in. Other sizes on special order. Weight about 2 lb. per sq. ft., 1 in. thick.

Superex Combination Insulation—One or more layers of 85% Magnesia or Asbesto-Sponge Felted are often used outside of Superex, this construction being termed Superex Combination Insulation. Such combination results in greater insulating efficiency and heat resistance for a given insulation thickness. The Superex is always used next to the hot surface as a protection for the other insulation, which, though high in insulation value, is comparatively low in heat resistance. The proper combination and thickness depends on the maximum operating temperature, average operating temperature, cost of heat and degree of temperature control required.

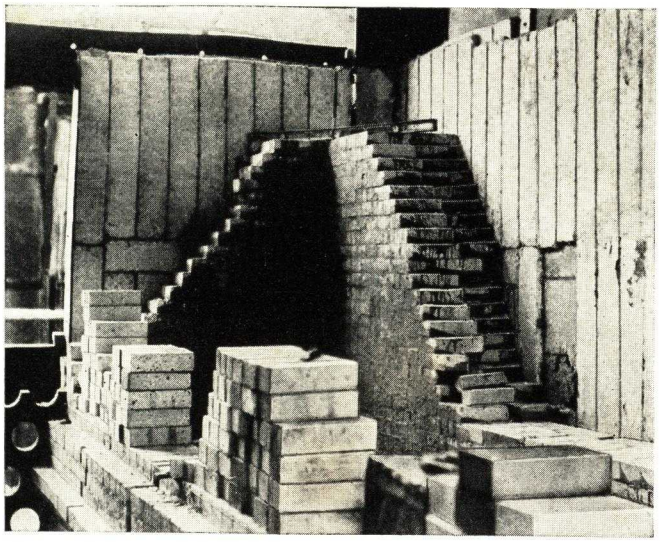
The figures in the following table for Superex Combination Insulation over metal surfaces are approximations based on usual conditions. To use the table, select the insulation combination which corresponds to the maximum temperature to which the inner surface of Superex will be subjected in service.

Where a greater thickness of insulation than that given in the table is used, the relative thickness of Superex to Magnesia or Asbesto-Sponge Felted should not be less than the proportions shown. The usual finish over the insulation is two coats of No. 302 Insulating Cement, each ¼ in. thick. If this finish is used outdoors, Insulkote either replaces the second cement coat or is applied ¼ in. thick over the ½ in. of cement. The heat loss noted in the table assumes a finish of ½ in. No. 302 Insulating Cement covered by ¼-in. Insulkote.

J-M BLOCK INSULATION ON METAL SURFACES

Maximum temperature on Superex, deg. F.	Thickness of Superex, inches	Thickness of Asbesto-Sponge Felted or 85% Magnesia, inches	Total thickness of block insulation, inches	Heat transmission, B.t.u., per sq. ft., per hr., at stated temperature		Average insulation efficiency, per cent
				85% Magnesia	Asbesto-Sponge Felted	
300	...	2	2	50.7	46.4	93.42
400	...	2½	2½	60.5	56.2	95.40
500	...	3	3	68.2	64.6	96.69
600	...	3½	3½	74.6	71.6	97.53
750	1½	2½	4	89.8	87.4	98.14
900	2	2	4	114.2	111.5	98.34
1000	2½	2	4½	118.1	116.2	98.66
1200	3½	1½	5	138.0	137.2	98.92

The same principles of combination insulation apply to the insulation of furnaces as to metal surfaces, except that brickwork has appreciable resistance in itself to heat flow. This changes the necessary total thickness of insulation and also affects the thickness of Superex to be used, due to the increase of temperature on the Superex materially above the temperature of the brick exterior if uninsulated. In such work it is sometimes also necessary to restrict the thickness of Superex when used alone, in order not to exceed the temperature limit of the insulation.



Superex Combination Insulation, 3½-in. Thick, Applied Between Transite Casing and Fire Brick Lining

Where the use of brick shapes is advantageous, Sil-O-Cel Natural Brick are used instead of Superex Blocks. Sil-O-Cel C-22 Brick and Sil-O-Cel Super Brick are used where more than 1600 deg. F. will be applied on the insulation.

Asbesto-Sponge Felted Sheets and Blocks—The most efficient insulation obtainable in these forms for temperatures to 700 deg. F. Built up of laminated sheets of asbestos felted with small particles of spongy, cellular material. Withstands rough usage and can be removed and replaced without injury. Furnished in sheets 24x36 in. and blocks 6x36 in., from ½ to 4 in. thick. Weight about 2½ lb. per sq. ft., 1 in. thick. Temperature limit, 700 deg. F., though often used as a second layer, over Superex, at much higher operating temperatures.

85% Magnesia Blocks and Lagging—One of the most efficient commercial insulations. Made of 85% carbonate of magnesia bonded with asbestos fibre. Furnished in blocks 3x18 in. or 6x36 in., flat or curved, in thicknesses of ½ to 4 in. Weight about 1.4 lb. per sq. ft., 1 in. thick. Other sizes, including locomotive lagging, furnished on special order. Temperature limit, 600 deg. F., though often used as a second layer, over Superex, at much higher operating temperatures.

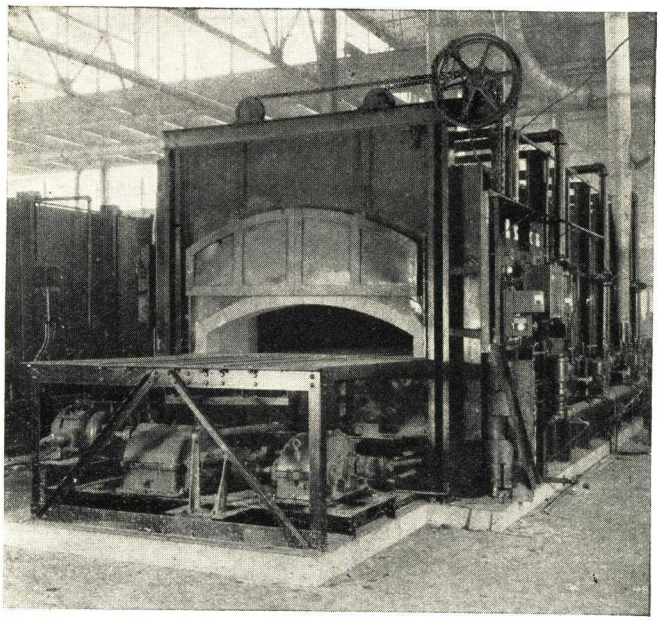
Super Fire-Felt Sheets and Blocks—A light-weight, efficient, resilient insulation made of felted asbestos fibre. Furnished in sheets 24x36 in., and blocks 6x36 in., ½ to 4 in. thick; also in special sizes and irregular shapes to order. Weight about 1.7 lb. per sq. ft., 1 in. thick. Temperature limit 700 or 1000 deg. F., depending upon supporting construction.

Banroc Blankets—Made of Banroc (rock wool) felted between various fabrics, usually metal, such as galvanized wire netting, copper-bearing metal lath, and rib lath. Used for insulating ovens, oil refinery equipment and for similar purposes. Standard sizes of most types, 24x96 in. and 24x48 in., in thicknesses 1 to 6 in. Temperature limit, 1000 deg. F.

Asbestos Blankets—Quilted asbestos cloth filled with asbestos fibre. Used for insulating irregular surfaces where readily removable insulation is desired, such as paper digester shells and steam turbine casings. Furnished in single or double layer construction. Temperature limit, 800 deg. F.

Asbestos Roll Fire-Felt—A soft, flexible asbestos felt that may be wrapped around pipes and heated surfaces. Furnished $\frac{3}{32}$, ⅛, $\frac{3}{16}$ and ¼ in. thick, in rolls 3 ft. wide, containing about 100 sq. ft. Weight about 1.2 lb. per sq. ft., ¼ in. thick.

Asbestos Millboard, Roll Board and Paper—Recommended where relatively thin protection against flame, heat or acid fumes is desired. Weights, thicknesses and sizes furnished on application.



Conveyor Hearth Furnace Insulated with Sil-O-Cel C-22 Brick, Superex Blocks and J-M 85% Magnesia Blocks

Industrial Insulation Applications

The fundamental purpose of insulation is to conserve heat, the loss of which from bare surfaces often amounts to several dollars per square foot per year. In many industrial applications, improvement in quality of product is attained by uniformity of temperature and the possibility of close temperature control, through use of suitable insulation. Protection of employees against excessive heat is another economically important result.

The construction of a furnace or oven, its operating temperature and continuity or discontinuity of its service, together with cost of heat, are the major factors which determine the character and thickness of insulation to be used.

Rotary Kilns—Rotary cement and lime kilns are insulated between steel shell and refractory lining with 2½ in. of Superex set up in No. 319 Semi-Refractory Cement. The insulation is omitted at the hot end for a distance equal to 25% of the kiln length, or a minimum of 45 ft. Insulation terminates flush with the upper end, except in wet process kilns where filters are not used, in which case the insulation is omitted for a distance of 20 ft. at the wet end. The refractory lining should be bonded to the steel shell longitudinally and circumferentially. With this construction, an average saving equivalent to 760 lb. of coal per sq. ft. per year has resulted, the cost of insulating materials being less than $0.50 per sq. ft., f.o.b. factories.

Furnaces—Insulation on furnaces saves fuel, provides closer temperature control, reduces air infiltration and assures better working conditions. Added to this is the decrease of internal strains and reduction in spalling because of the smaller temperature differential between the inside and outside of the refractory. Insulation placed over the exterior of furnace brickwork promotes heat flow along the walls, and cooler portions of the furnace are raised to a higher temperature. Wall cracks, caused by uneven expansion and contraction, are fewer and smaller. Lower temperatures may be used in the heating zone yet adequate temperatures still be maintained throughout the furnace setting, which saves fuel and further prevents rapid deterioration of the refractories.

Superex Blocks, Superex-Magnesia Combination Insulation, or Sil-O-Cel Brick are usually applied between or behind the buckstays, next to the refractory lining, to a thickness sufficient to accomplish the purpose for which insulation is applied. At places of unusual thrust, such as opposite a sprung arch, or where castings and steel work are hung into the brickwork, the fire brick is carried through the insulation to the outside of the furnace. The thickness applied may vary from 2 in. on billet heating furnaces to 20 in. or more on electric oven furnaces. Furnace bases should be insulated under the refractory with a minimum of 4 in. of Sil-O-Cel C-3 Concrete.

Brickset Boilers—Insulation of brickset boilers is similar to furnace insulation. A veneer layer of Superex Insulation or Superex-Magnesia Combination Insulation is applied over the brick to a thickness depending on the design of the boiler and, preferably, finished with flat Transite. If brick shapes are preferred, Sil-O-Cel Brick are laid up, either bonded or unbonded, to the exterior of the fire brick. In core wall construction, Sil-O-Cel Brick are built in as a core between the fire brick and an outer wall of red brick.

Water Walls—Water tube boiler walls are insulated with about 4 in. of J-M 85% Magnesia Blocks in two layers or, if the temperature is high, Superex Combination Insulation. The whole is cased with Transite panels, battened with steel strips, which makes a neat, removable and replaceable casing of remarkable durability. The heat saving of such construction amounts to more than 90% of the uninsulated loss.

Air-cooled Walls—On ventilated boiler walls, the casing over air space is best made of flat Transite, lined with 1 in. of Super Fire-Felt or Superex. A protective surface, next to the air space, is provided by J-M No. 101-S Asbestos Sheet Millboard. This panel construction between the buckstays gives superior insulation with minimum thickness. Such a casing is tight, fireproof, sectionally removable and replaceable and economical of floor space.

Regenerators—The walls of new regenerators used with high temperature furnaces are insulated with 4 in. of Superex Blocks or 4½ in. of Sil-O-Cel Brick, inside the steel casing. Roofs are insulated with 2 in. of Superex or 2½ in. of Sil-O-Cel Brick. Sections below ground are insulated with 4 in. of Sil-O-Cel C-3 Concrete. Existing regenerator walls are also insulated with 4 in. of Sil-O-Cel C-3 Concrete, and Sil-O-Cel C-3 (granular) is spread 2½ in. thick on the roof surface. It is not unusual for insulation on regenerators to repay its cost in a year's time through heat saving accomplished, not to mention improved production through minimized air infiltration.

Producer Gas Mains—Producer gas mains are insulated between refractory lining and steel shell with 2½ to 4 in. of Superex Blocks. Sil-O-Cel Brick are similarly used in 2½ or 4½ in. thickness. Such insulation reduces tar deposition, keeps the gas of higher heat value and makes fewer burnouts necessary. Superex Blocks, 2½ in. thick, save in heat over four times their cost in a year of operation, assuming 1400 deg. F. gas, and sensible heat worth $0.25 per million B.t.u.

Flues and Breechings—High temperature flues and breechings are insulated inside with 2-in. Superex Blocks or 2½-in. Sil-O-Cel Brick, secured by metal strips or wire. Over the inside surface of the insulation, are applied two or three ¼-in. layers of No. 319 Semi-Refractory Cement, which becomes hard and resistant to abrasion, protecting the insulation from erosion by dust-laden gases. Lower temperature breechings are insulated outside with J-M 85% Magnesia or Superex. The usual finish over the insulation is No. 302 Insulating Cement, applied in two coats, each ¼ in. thick.

Stacks—Steel stacks should be lined with 2½-in. Sil-O-Cel Brick, laced to circumferential angles on 37-in. vertical centers, and finished with ½ in. of No. 319 Semi-Refractory Cement, applied in two coats, over 1-in. hexagonal mesh reinforcing. This construction prevents corrosion, increases draft, reduces fire hazard and keeps adjacent space from becoming too warm.

Hot Blast Stoves—The approved insulation for hot blast stoves consists of 2½ in. of Superex Blocks next to the shell, with 4½ in. of the fire brick lining, immediately inside the Superex, replaced by 4½ in. of Sil-O-Cel C-22 Brick. Older practice made use of Superex only, but replacing 4½ in. of fire brick with C-22 Brick has proved amply justified by the excellent return on investment. The insulation pays for itself in a few months' operation, stove capacity is increased and checkerwork lasts longer.

Hot Blast Mains—The generally recommended insulation for hot blast mains and bustle pipes is a 4½-in. course of Sil-O-Cel C-22 Brick behind a 4½-in. course of fire brick. This construction reduces radiation loss 60 or 70 per cent compared to that from an uninsulated 9-in. fire brick lining.

Annealing Furnaces—The exterior brickwork of annealing and normalizing furnaces is insulated with a minimum of 4-in. Superex Blocks or 4½-in. Sil-O-Cel Brick. For electrically heated equipment, much heavier insulation is necessary. The finish may be ½ in. of No. 302 Insulating Cement, applied in two coats, over reinforcing, but ⅜-in. Transite or steel plate gives a much more durable wearing surface.

Lehrs—The thickness of glass lehr insulation is largely dependent upon the individual design, with heat saving seldom the most important item. Uniformity and control of temperature and quality of product are usually determining factors.

The economical thickness of insulation, as calculated from heat saving, may range from 3½ in., if fuel is cheap, to 18 or 20 in. in an electric lehr. Superex or Sil-O-Cel are the materials recommended. Some of the largest continuous electric lehrs use Sil-O-Cel C-22 Brick and Sil-O-Cel Super Brick for the entire lehr lining, with no refractory. This is of advantage in reducing heat storage capacity of the walls and in shortening the time necessary to bring the lehr to temperature.

Ceramic Kilns—Modern practice in ceramic kilns includes adequate insulation, not only to save fuel but also for better temperature control and greater uniformity in the finished product. Periodic kilns are insulated in the base with 3 to 4 in. of Sil-O-Cel C-3 Concrete, and in the sides with 4½ in. of Sil-O-Cel C-22 or Natural Brick (depending upon temperature), in core wall construction between the fire brick and red brick. On crowns, through which heat loss is great if uninsulated, the insulation consists of two 2½-in. layers of Sil-O-Cel C-22 or Natural Brick, or Superex Blocks, followed by a platen course of red brick and by waterproofing. Continuous tunnel kilns, with their large radiating surfaces, cannot be operated economically without thorough insulation. Sil-O-Cel Powder or Coarse Grade is generally used from 4 to 12 in. thick on sides and top. Both Sil-O-Cel C-22 Brick and Sil-O-Cel C-3 Concrete are widely used in insulating the decks of tunnel kiln cars.

Gas Making Equipment—Insulation is as necessary in the manufacture of gas as in its economical utilization as fuel. One standard design of water gas set (generator, carburetter and superheater), uses 4 in. of Sil-O-Cel C-3 Concrete under fire brick in the base, two 1½-in. layers of Superex Blocks in the sides, between the refractory and shell, and two 2-in. layers of Superex Blocks over the fire brick in the cone top. Similar construction is employed in insulating oil gas sets. Horizontal or inclined coal gas retort benches are insulated with a minimum of 4 in. of Sil-O-Cel C-3 Concrete in the base, 4½ in. of Sil-O-Cel C-22 or Natural Brick in core wall construction on the sides, and two 2½-in. layers of Sil-O-Cel Brick or Superex Blocks on the top, covered with red brick or paving brick. The walls of vertical retort benches are also insulated with 4½ in. of Sil-O-Cel Brick.

Towers and Stills—Oil towers and stills are insulated with Superex-Magnesia Combination Insulation to the thickness indicated in the table on page 1. The finish is usually No. 302 Insulating Cement, waterproofed with Insulkote or Aertite.

Tanks—The side walls of vertical steel tanks, operating between 100 and 600 deg. F., are insulated with J-M 85% Magnesia Blocks or Banroc Blankets to the thickness shown in the following table. Roof insulation consists of Magnesia Blocks, ordinarily ½ in. less in thickness than the side wall insulation. The wall finish is Transite or Insulkote, the roof finish either black or white asbestos felt.

Temperature, deg. F.	Shell insulation, thickness
100 to 300	2 inches
300 to 400	2½ inches
400 to 500	3 inches
500 to 600	3½ inches

Industrial Ovens—Industrial ovens operate through a wide temperature range for heating, baking and drying. Heat saving, temperature control and cool workrooms are the usual factors to be considered in insulating. For example, electrically heated "V" type fender and sheet metal ovens are properly insulated with 6 in. of J-M 85% Magnesia at the vertex and 4 in. on the lower legs. Field-built body, chassis, frame and wheel ovens are similarly insulated, the thickness of insulation varying with oven temperature and fuel cost. In either case the finish over the insulation may be Transite or No. 302 Insulating Cement. Bread ovens demand adequate insulation for fuel economy, more uniform soaking heat, close temperature control and cool bakeries. Magnesia Blocks, 6 in. thick, are one of the standard insulation specifications for travelling bread ovens, with cement finish on top and Transite casing on the sides.

Pulp Digesters—Paper pulp digesters offer another example of the economy possible through insulation. In the case of twenty-two 14-ft. spherical digesters, insulated with 1½-in. J-M 85% Magnesia and waterproofed with Insulkote, the net return figures $5,742.00 per year on an original investment of $9,900.00 for insulation.

Send for "J-M Service to the Power Plant," Form GI-2A

JOHNS-MANVILLE PIPE INSULATION FOR HEATED LINES

Johns-Manville furnishes many kinds of insulation in a form suitable for insulating pipes conveying heated fluids. A few of these products are described below.

Asbesto-Sponge Felted Pipe Insulation—Asbesto-Sponge Felted is built up of laminated sheets of asbestos fibre felted with spongy, cellular material. It is the most efficient commercial heat insulation for pipes conveying liquids and vapors at temperatures not exceeding 700 deg. F., although it is often used as a second layer, outside a layer of Superex, at much higher operating temperatures. Its construction gives sufficient mechanical strength to withstand severe usage and vibration. Another advantage of Asbesto-Sponge Felted is the fact that it can be removed and replaced without deterioration.

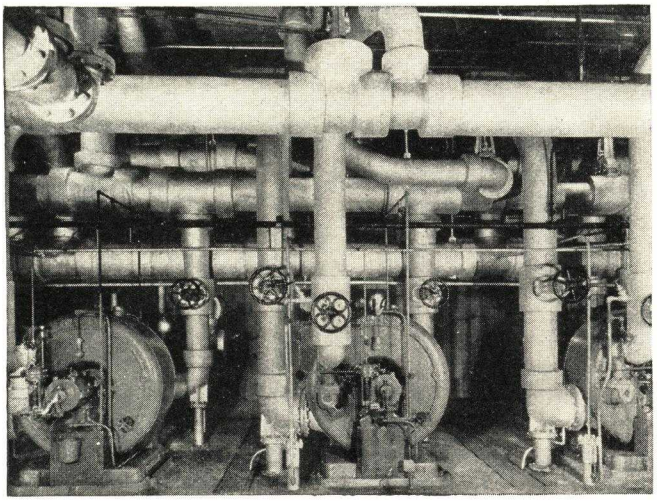
For outdoor lines, particularly those of some length, the most satisfactory insulation is Asbesto-Sponge Felted with an integral waterproof jacket. The integral jacket provides complete weather protection and obviates the labor of a separate application.

Asbesto-Sponge Felted is furnished in 3-ft. sections in thicknesses from standard (approximately 1 in.) to 3 in. to fit commercial pipe sizes.

85% Magnesia Pipe Insulation—One of the most generally used insulations. Made of highly efficient 85% carbonate of magnesia bonded with asbestos fibre. Furnished in 3-ft. sections in the following thicknesses: Standard, 1½, 2, 2½ in., Double Standard, and 3 in., to fit pipe sizes up to 10 or 12 in. For larger sizes, curved segments or lagging are supplied. Temperature limit, 600 deg. F., although Magnesia is often used as a second layer, outside a layer of Superex, at much higher operating temperatures.

Superex Pipe Insulation—In the range of temperatures so high that Asbesto-Sponge Felted or 85% Magnesia should not be used, Superex Pipe Insulation is the proper material. It is made of diatomaceous silica and asbestos fibre, bonded together. The temperature limit is 1600 deg. F. Sometimes Asbesto-Sponge Felted is used outside of Superex for mechanical protection of the Superex and to increase insulating efficiency. Magnesia is also often used as an outside layer where the insulation is not subject to abrasion, because it is a little more economical in first cost and is a slightly better insulator than Superex. These combinations of Superex and Asbesto-Sponge Felted or 85% Magnesia are known as Superex Combination Insulation.

Superex is furnished in standard sections, 3 ft. long, in thicknesses from 1 to 3 in., for pipe sizes to 10 or 12 in. For larger pipe sizes it is furnished in segments.



Piping Insulated with Superex Combination Insulation and with J-M 85% Magnesia

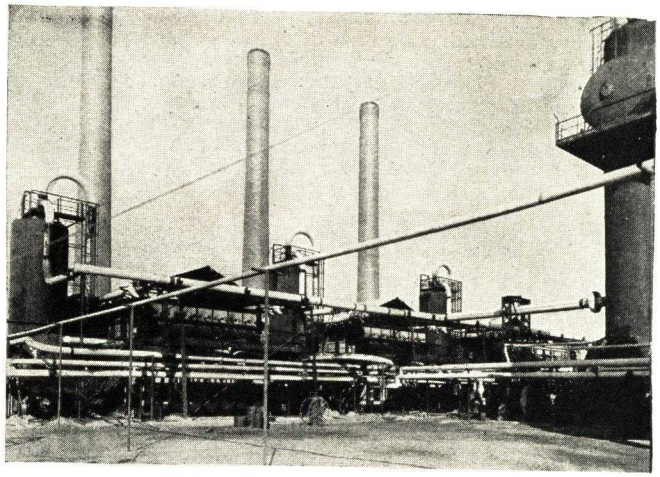
Generally speaking, Asbesto-Sponge Felted, 85% Magnesia, or Superex will solve any insulation problem on heated pipes which ordinarily arises, but other materials are available and frequently may be used to advantage. Complete information on the application of these materials is available at any Johns-Manville office.

Banroc Pipe Insulation—Made of rock wool, in two types. Style No. 25, with metal lath outside and inside, is used where a cement finish is desired. Furnished in 2-ft. sections, 1 to 4 in. thick, for pipe sizes of 2 in. and larger. Style No. 65, with a 24-gauge galvanized iron outer casing, is used where a waterproof and fireproof jacket is desired and where insulation must be frequently removed. Furnished in 2-ft. sections, 1 to 4 in. thick, for pipe sizes 2 in. and larger. Special shapes furnished for flanges and bends. Temperature limit, both types, 1000 deg. F.

Pre-shrunk Asbestocel Pipe Insulation—Made of alternate layers of plain and corrugated asbestos felts with cross-corrugations at regular intervals. It is manufactured of water-proofed felts which prevent the objectionable shrinkage encountered with other types of cellular insulation. Used on domestic steam and hot water piping. The cross-corrugations give it considerably higher efficiency than ordinary air cell insulation. Made four plies to the inch in 3-ft. sections, in thicknesses of two, three and four plies, to fit standard pipe sizes. The high-speed type is finished with aluminum or asbestos, requires no pasting and saves one-third in application labor. Regular canvas-covered finish is also available. Fine Corrugated Pre-shrunk Asbestocel is made six plies to the inch, in 3-ft. sections in four and six-ply thicknesses. Temperature limit, both styles, 300 deg. F.

Asbestocel in flexible roll form is made of a plain and a corrugated asbestos felt cemented together. Approximate thickness, ¼ in. Used, in at least 2 layers, for hot-air heater or furnace pipes. Furnished 37 in. wide, in rolls of about 250 sq. ft. Also furnished fine corrugated, ⅛ in. thick, in 300-sq. ft. rolls. Temperature limit, 300 deg. F.

Wool Felt Pipe Insulation—Made of specially indented wool felt and provided with a dual-service liner for use on hot or cold water lines. Supplied in either canvas or dull-coated aluminum finish, the latter being especially designed for use where pipes are exposed to view, as in basement recreation rooms, etc. Furnished in 3-ft. sections, in thicknesses of ½, ¾ and 1 in., double ½ in. and double ¾ in. for all pipe sizes from ½ to 5 in. The double layer construction permits the breaking of all through joints.



Asbesto-Sponge Felted Withstands Severe Service on Outdoor Lines

Ric-Wil Underground Conduit System

Ric-Wil Conduit offers a stable, effective, and economical means of insulating underground pipes carrying steam or hot water.

The system is complete, consisting of special vitrified tile conduit and base drain, iron pipe supports and rollers, and Dry-paC water-proofed insulation, for temperatures up to 700 deg. F.

Detailed recommendations to meet particular conditions will be furnished upon request.

Pipe Insulation Recommendations

The tables of thicknesses given below represent standardized practice in general use on heated lines. Exceptional conditions may make necessary thicker insulation. Where piping is located outdoors, it is customary to use insulation ½ in. thicker than that used on the lines indoors.

For Temperatures to 600 deg. F.

PIPE INSULATION RECOMMENDATIONS FOR MAGNESIA OR ASBESTO-SPONGE FELTED

Thickness of insulation, J-M 85% Magnesia			Temperature, deg. F.	Thickness of insulation, Asbesto-Sponge Felted		
Pipes larger than 4 in.	Pipes 2 in. to 4 in.	Pipes smaller than 2 in.		Pipes larger than 4 in.	Pipes 2 in. to 4 in.	Pipes smaller than 2 in.
Std.	Std.	Std.	Room to 211	1 in.	1 in.	1 in.
Std.	Std.	Std.	212 to 266	1 in.	1 in.	1 in.
1½ in.	Std.	Std.	267 to 337	1½ in.	1 in.	1 in.
2 in.	1½ in.	Std.	338 to 387	2 in.	1½ in.	1 in.
Dbl. Std.	2 in.	1½ in.	388 to 499	2½ in.	2 in.	1½ in.
3 in.	Dbl. Std.	2 in.	500 to 599	3 in.	2½ in.	2 in.
			600 to 700	3½ in.	3 in.	2 in.

In general, all pipes, fittings and flanges at temperatures below 600 deg. F., except small fittings which are insulated with J-M No. 302 Cement, should be insulated with Asbesto-Sponge Felted or J-M 85% Magnesia to the thickness given in the table. Asbesto-Sponge Felted Pipe Insulation may be used, where service conditions warrant, up to 700 deg. F.

For Temperatures above 600 deg. F.

PIPE INSULATION RECOMMENDATIONS FOR SUPEREX COMBINATION INSULATION

Temperatures	600-699 deg. F.		700-799 deg. F.		800-1000 deg. F.	
	Thickness of insulation		Thickness of insulation		Thickness of insulation	
Pipe size, inches	Superex, inches	85% Magnesia, inches	Superex, inches	Asbesto-Sponge Felted, or 85% Magnesia, inches	Superex, inches	Asbesto-Sponge Felted, or 85% Magnesia, inches
1½ and smaller	2	...	2	...	2	...
2	1¼	1½	1¼	2	1 9/16	1½
2½	1 5/16	1½	1 5/16	2	1 13/16	1½
3	1 9/16	1½	1 9/16	2	2 1/16	1½
3½	1 5/16	1½	1 5/16	2	1 13/16	1½
4	1 9/16	1½	1 9/16	2	2 1/16	1½
4½	1 5/16	2	1 5/16	2½	1 13/16	2
5 and larger, approx.	1½	2	1½	2½	2	2

All pipes 1½ in. and smaller, at temperatures above 600 deg. F. (or above 700 deg. F., if Asbesto-Sponge Felted is used), should be insulated with a single layer of Superex sectional pipe insulation 2 in. thick. Small fittings are insulated with J-M No. 302 Cement. For pipe sizes larger than 1½ in., at temperatures above 600 or 700 deg. F., Superex Combination Insulation is used. This consists of a layer of Superex next to the pipe, over which is applied a layer of either Asbesto-Sponge Felted or J-M 85% Magnesia, as conditions require.

Finish of Insulation—All insulation on piping indoors should be finished with a jacket of 8-oz. canvas, sewed on over rosin-sized paper or asbestos paper, sized with glue and painted with two coats of lead and oil paint.

Where other insulation than Asbesto-Sponge Felted with integral waterproof jacket is used, the best weather protection for insulated pipe lines out-of-doors is a waterproof asbestos jacket of J-M Double-Coated Flexstone, fastened by rings of heavy copperweld wire on 4-in. centers. Double-Coated Flexstone is furnished in rolls of 108 sq. ft., 32 in. wide, weighing approximately 55 lb.

Where rough usage may be encountered a suitable metal jacket may be used instead of the weather-proof jacket.

Where exposed to fire hazard, it is good practice to apply a J-M Asbestos Firetard Jacket. In such cases the application of asphalt-saturated roofing jackets is inadvisable since flame may be carried along exposed piping when a fire occurs adjacent to lines so protected. The Firetard Jacket consists of one sheet of asphalt-saturated asbestos felt over which is cemented an unsaturated felt. It will not drip asphalt, carry flame or support combustion.

JOHNS-MANVILLE INSULATING CEMENTS, FILLERS AND FINISHES

Insulating Cements

No. 0352 Asbestocel Cement—A general utility short-fibre cement. Temperature limit, 1000 deg. F. Packed in 100-lb. bags, which cover 19 sq. ft., 1 in. thick.

No. 302 Insulating Cement—Made from asbestos fibre and binding materials. Used as a finish over insulation to provide a hard, durable and attractive surface. Temperature limit, 1000 deg. F. Packed in 100-lb. bags, which cover 25 sq. ft., 1 in. thick.

No. 304 Hot Blast Cement—Made from long fibre asbestos. Not as smooth a finishing cement as No. 302 but withstands slightly higher temperatures. Temperature limit, 1200 deg. F. Packed in 100-lb. bags, which cover 18 sq. ft., 1 in. thick.

No. 319 Semi-Refractory Cement—A combination insulating and semi-refractory cement used to protect block or brick insulation in flues, stacks, etc. Temperature limit, 1600 deg. F. Packed in 50-lb. bags, which cover 7½ sq. ft., 1 in. thick; or 15 sq. ft., 1 in. thick, per 100 lb.

No. 450 Insulating Cement—A high-grade insulating cement for applying in thicknesses equal to block insulation where the latter cannot be used. Adheres readily to hot or cold surfaces but is not a finishing cement. Temperature limit, 1200 deg. F. Packed in 50-lb. bags, which cover 20 sq. ft., 1 in. thick; or 40 sq. ft., 1 in. thick, per 100 lb.

No. 500 Insulating Cement—High heat resistance and great covering capacity make this the most adaptable material where insulation in cement form is required. Temperature limit, 1500 deg. F. Packed in 50-lb. cartons which cover 35 sq. ft., 1 in. thick; or 70 sq. ft., 1 in. thick per 100 lb.

Insulating Fillers

It is ordinarily preferable to use insulation in the form of blocks, bricks or pipe sections. In some instances, however, conditions render impracticable the use of solid insulation and then insulating fillers are adapted to serve the purpose.

Sil-O-Cel C-3—A coarse, granular calcined diatomaceous silica (Celite), used as an insulating filling on high temperature equipment. Temperature limit, 2000 deg. F. Weight loose, 28 lb. per cu. ft.; packed, 31 lb. per cu. ft. Also used in making Sil-O-Cel C-3 Concrete. Furnished in 100-lb. bags.

Sil-O-Cel Coarse Grade—Coarsely ground diatomaceous silica (Celite), used as an insulating filler. Temperature limit, 1600 deg. F. Usually packed to density of 22 lb. per cu. ft. Furnished in 110-lb. bags.

Sil-O-Cel Insulating Powder—Finely ground diatomaceous silica (Celite), used as an insulating filler. Temperature limit, 1600 deg. F. Weight loose, about 12 lb. per cu. ft.; packed, 15 to 17 lb. per cu. ft. Furnished in 100-lb. bags.

Fibro-Cel—A mixture of diatomaceous silica and long fibre asbestos. Does not settle under vibration or sift through cracks, hence well adapted for use as filling material on gas generator sets, etc. Temperature limit, 1800 deg. F. Usually packed to density of 18 lb. per cu. ft. Furnished in 80-lb. bags.

Fil-Insul—An asbestos filling material used where a resilient, non-settling insulation is desired for medium temperature applications. Because of its fibrous nature, it will not sift through cracks. Temperature limit, 1000 deg. F. Usually packed to density of 17 lb. per cu. ft. Furnished in 80-lb. bags.

Banroc Loose—Loose rock wool fibre produced from fused argillaceous limestone blown into fibres by steam. Used as an insulating filling in ovens, fireless cookers, electric and gas ranges and similar equipment. Temperature limit, 1000 deg. F. Packed in place to required density, usually 12 lb. per cu. ft. is sufficient. Usually furnished in 50-lb. bags. Can also be furnished granulated *(Banroc Granulated)* in 50-lb. bags.

Insulating Concrete

Insulating concrete has found excellent application because it may be cast into any desired form and used for lining furnace doors, insulating furnace bases and for a wide variety of other purposes where a semi-refractory insulation is required.

Sil-O-Cel C-3 Concrete—Semi-refractory insulating concrete for lining furnace doors and bases and for monolithic construction of japanning, enameling and core ovens. When suitably reinforced, large slabs may be made which are useful as baffles, dampers, etc. Sometimes Firecrete Refractory Cement is employed as a protective facing over the C-3 Concrete.

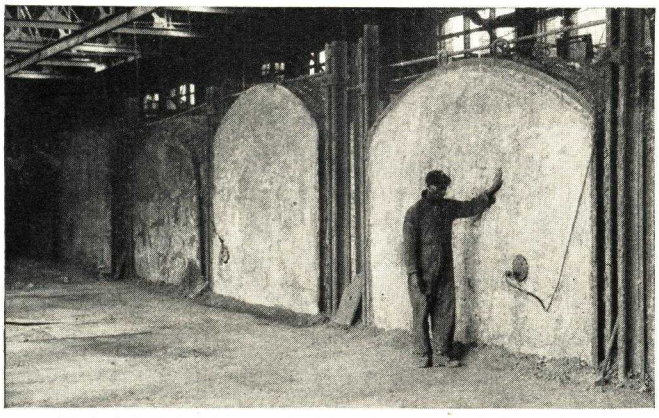
Sil-O-Cel C-3 Insulating Concrete is made by mixing four parts, by volume, of Sil-O-Cel C-3 and one part of portland cement, with sufficient water to form a plastic, coherent mass. For this purpose approximately 28 lb. of Sil-O-Cel C-3 are required per cubic foot, when rammed into place and dried. The concrete weighs about 60 lb. per cu. ft.

This insulating concrete is over three times as effective as fire brick in preventing heat penetration. Made in accordance with specifications, the material sets up into a strong, durable concrete with a crushing strength of about 1,000 lb. per sq. in. It can be used without other refractory protection where it may be subjected to direct heat as high as 1800 deg. F.

Ovens, where the heating operation is carried on at a comparatively low temperature, are in many cases now being constructed entirely of Sil-O-Cel C-3 Concrete. Fuel consumption is surprisingly low, due to the insulating properties of Sil-O-Cel C-3 Concrete and the fact that all masonry joints are eliminated.

Sil-O-Cel C-3 Concrete is an ideal material for insulating the bases of heat-treating furnaces, kilns, oil still furnaces, hot blast stoves, open-hearth furnace regenerators and flues, and in many other types of high temperature equipment. This application is important, not only because of the fuel saving, but also because it insures more uniform heat distribution within the equipment and protects foundations from excessive heat.

Sil-O-Cel C-3 Concrete as used in the construction of furnace doors reduces costly heat waste, increases the output of the furnace, makes temperatures more uniform, improves control, and betters conditions for the operators. It weighs less than half as much as fire brick, conducts less than one-third as much heat and costs less per door installed.



Sil-O-Cel C-3 Concrete Cast into Monolithic Furnace Doors

Sil-O-Cel C-3 Concrete is excellent for making up special shapes such as baffles, dampers, etc. It is also cast into covers for wheel annealing pits; used as an insulating lining for hot metal cars in steel mills; for the construction of fire screens to protect workmen operating in front of open furnace doors; and for a great variety of other uses. In many cases Sil-O-Cel C-3 Concrete is particularly adapted for insulating the outside of walls of equipment previously constructed without insulation.

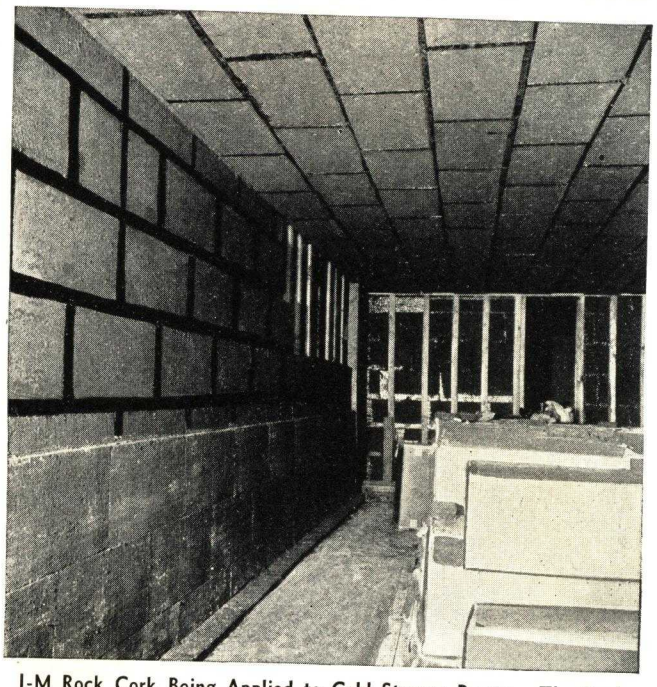
Waterproof Finishes

Certain applications demand the use of a weather-resisting, damp-proof, plastic material that can be troweled over an insulated surface as a final finish.

Insulkote—A durable, easily applied, weather-proof coating for insulated surfaces. Gray in color after aging. Can be painted with aluminum paint if desired. Temperature limit 400 deg. F. Covers 45 sq. ft., ¼ in. thick, per 100 lb. Furnished in 50, 150, 300 and 500-lb. containers. Orders placed between October 1 and May 1 are filled with "Winter Insulkote," for use when the temperature of the air is below 45 deg. F.

Aertite Coating—A tough, rubbery, asphaltic-asbestos coating in plastic form, often used like Insulkote, for weatherproofing insulation outdoors. Temperature limit, 250 deg. F. Its primary use is for coating boiler walls to prevent air infiltration. For a ⅛-in. coat, 50 to 80 lb. are required per 100 sq. ft., depending upon character of surface. Furnished in 25, 50, 150, 300 and 500-lb. containers.

JOHNS-MANVILLE INSULATION FOR COLD SURFACES



J-M Rock Cork Being Applied to Cold Storage Rooms. The Rock Cork Partition Is Self-sustaining

A ton of refrigeration costs approximately 10 times as much as the equivalent number of B.t.u. produced for heating purposes. The necessity for much heavier insulation on low temperature work than is customarily used for high temperatures is, therefore, immediately apparent. Furthermore, many forms of cold storage demand that temperatures be controlled within a narrow range, a condition equally common in the cold processing of oils and chemicals. Such close control cannot be maintained without adequate insulation.

All the requisites of a satisfactory low temperature insulation are met by J-M insulations for cold surfaces, chief of which is Rock Cork, whose record of more than 20 years' successful use makes it the outstanding insulation for practically every class of low temperature work.

J-M Rock Cork—Rock Cork is a highly efficient low-temperature insulation manufactured from Banroc (loose rock wool) combined with a waterproof binder, moulded and baked. Its conductivity is 0.33 B.t.u. per sq. ft., per deg. F. difference, per hour, per 1-in. thickness.

Due to the unchanging character of the material its continued high insulating value during service is assured.

It is highly resistant to absorption and, due to the nature of the waterproof binder, furnishes an ideal base for an asphaltic adhesive medium or asphaltic cement finish, assuring an air-tight waterproof seal.

Its manufacture produces a firm structure which permits it to be readily handled in any type of construction, and has sufficient flexibility to follow slight irregularities of the surface to be insulated, adhering uniformly and thus eliminating voids between the insulation and the wall.

Sheets can be curved in application to fit tanks 20 ft. diam. or greater, eliminating the necessity of lags for such work.

Rock Cork is furnished in standard sheets, 18x36 in., in 1½, 1¾, 2, 2½, 3, 3½ and 4-in. thicknesses; also 18x18x1 in. Weight, about 1.25 lb. per sq. ft., 1 in. thick. Lagging, for diameters from 11 in. to 20 ft., is supplied 18 in. long, in thicknesses of 1½, 2, 3 and 4 in., and in widths 2 to 5 in., depending upon diameter.

Granulated Rock Cork, a loose, moisture-resisting filling for insulating ice freezing tanks, etc., is customarily used in twice the thickness of Rock Cork in sheet form. Packed in place to a density of about 14 lb. per cu. ft. Shipped in 50-lb. bags. Usual temperature limit of all Rock Cork products, 100 deg. F.

RECOMMENDED THICKNESSES OF ROCK CORK FOR VARIOUS TEMPERATURES AND CONDITIONS

For general purposes, the thicknesses recommended for Rock Cork Sheets or Lagging are indicated in the table below:

Temperature range, deg. F.	Thickness
−60 to −40	12 in.—Three layers
−40 to −25	10 in.—Three layers
−25 to −15	8 in.—Two layers
−15 to 0	7 in.—Two layers
0 to 15	6 in.—Two layers
15 to 25	5 in.—Two layers
25 to 40	4 in.—One or two layers
40 to 50	3 in.—Single layer
Above 50	2 in.—Single layer

Recommendations for specific installations, with construction details, will be furnished upon application at any Johns-Manville office.

Built-up Brine and Ammonia Pipe Insulation—Built-up on the job, in 2 to 6 layers of 1-in. hair felt thoroughly sealed with a waterproof membrane. Used on pipes carrying low temperature fluids, such as brine and ammonia.

Cork Insulation—A full line of natural cork insulation is carried by Johns-Manville, including corkboard sheets and lagging, granulated cork, sectional cork pipe insulation, moulded cork fittings and accessories.

Built-up Hair Felt Pipe Insulation—Built-up on the job, in layers of 1-in. hair felt spirally secured with jute twine and finished with a waterproof jacket. Used to prevent water lines from freezing, the thickness varying with conditions.

Anti-Sweat Pipe Insulation—Made of laminated insulating felt, protected inside and out with waterproofing felts. Used to insulate cold water pipes and to prevent condensation. Furnished in 3-ft. sections, in thicknesses of ½ and ¾-in. solid construction, and 1, 1½ and 2-in. broken joint construction, to fit standard pipe sizes. Waterproofing felts are also used between layers on broken joint construction.

Zero Pipe Insulation—Composed of layers of hair felt and wool felt, with a layer of asphalt-saturated wool felt inside. Used to prevent water pipes from freezing under moderate conditions. Must be weather-proofed if used on outdoor lines. Furnished in 3-ft. sections, 1¼ in. thick only, for standard pipe sizes.

Send for Brochure on J-M Rock Cork, Form IN-9A

JOHNS-MANVILLE PACKINGS

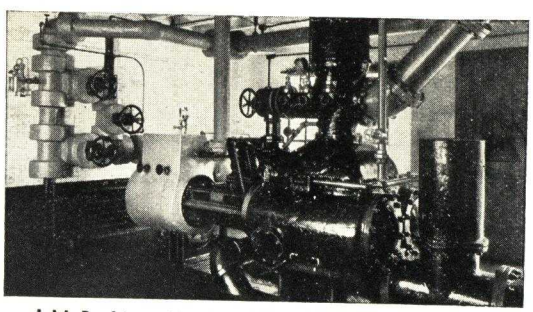
The Johns-Manville line of packings has proved its dependability and economy for all types of industrial service.

Sea Rings, an automatic packing for reciprocating rods, have surprisingly long life under severe service against any fluid, from mercury vapor to molasses.

Kearsarge Rod packing for steam, Mogul for valve stems, J-M Flax for hydraulics, Semi-Metallic for centrifugals, Service Sheet for general requirements, Kearsarge Gaskets for boilers, are a few of the well-known standard materials.

Rod, plunger, valve stem, piston, sheet packing and gaskets for any service—every requirement is met by some J-M product specially designed to serve the purpose.

All these packings are described in the J-M packing booklet, Form PK-2A, which will be promptly sent on request, by any Johns-Manville office.



J-M Packings Used in Pump, Valves and Flanges

JOHNS-MANVILLE REFRACTORY CEMENTS

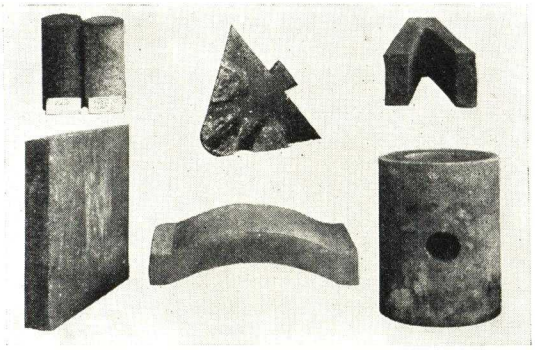
J-M Refractory Cements are used for setting or bonding fire brick, as protective coatings, for patching settings, as monolithic linings, and for making refractory shapes. They resist temperature, disintegration and spalling; do not break the bond by shrinking or swelling or by reaction with furnace ash, slags or gases.

Exposure of the edges of brick to the action of flame and molten ash is the commonest cause of rapid deterioration of a setting. J-M Refractory Cement protects the edges of the brick; heat losses are cut down because open joints between the brick are eliminated; the tight construction protects the insulation from furnace gases and vapors; and air, which might otherwise be drawn in through the walls, is excluded.

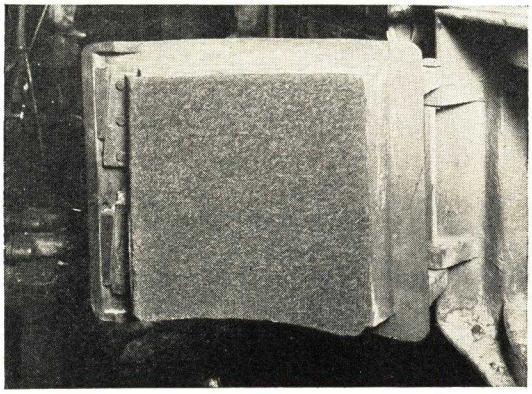
Brickwork well-protected with J-M Refractory Cement will stand higher temperatures because the softening heat does not have access to the fire brick except at one face. Spalling, too, is decreased by this construction, because there is a more uniform temperature gradient through the brick. Clinker deposits are retarded by eliminating open joints and by making surfaces as smooth as possible with wash-coating.

The erosive action of oil flame and the slagging of brick by low-fusion ash are mitigated in a setting with tightly sealed joints and brick pores filled by wash-coating. This also tends to prevent brick disintegration by the action of furnace gases. A correctly applied patch will greatly retard further deterioration of refractories which are spalling or melting away from any of these causes.

If the brickwork has failed locally, instead of replacing the destroyed brick, it is frequently economical to take out the old brick and pound in J-M Plastic Fire Brick Material. Pit fires, metal ladles, induction furnaces and domestic oil burning furnaces may be effectively lined with the proper J-M Refractory Cement, rammed or poured in to form a monolithic refractory interior.



Some of the Shapes Easily Cast with Firecrete



Inspection Door Lined with Firecrete

J-M Refractory Cement Recommendations

A good refractory cement should have approximately the same base as the refractory used, and a temperature resistance equal to or better than the brick. The bonding strength and other properties should be such that the cement will not separate from the fire brick due to movement in the setting and the refractory cement should be chemically inert to the action of the furnace.

The great variety of industrial furnace conditions precludes the possibility of using one type of refractory cement to meet all requirements. From a complete line, developed to serve specialized purposes, Johns-Manville recommends the following cements for general work:

For a brick-to-brick, or dipped, joint and for wash-coating, J-M No. 32 Refractory Cement (dry) or J-M No. 20 Plastic Refractory Cement (thinned). For a bond joint (⅛ to $\frac{3}{16}$ in.), J-M No. 31 Refractory Cement (dry) or J-M No. 20 Plastic Refractory Cement. For hot patching, J-M No. 29 Plastic Refractory Cement. For light patching, J-M No. 33 Super-Refractory Cement. For heavy patching, J-M Plastic Fire Brick Material. For making monolithic linings and refractory shapes, J-M Firecrete.

A brochure will be mailed on request, which gives complete information on refractory cements and their uses in various industries.

Send for Brochures: "J-M Refractory Cements," Form RC-4A; and "Refractory Cements for Oil Burners," Form RC-3A

DATA ON JOHNS-MANVILLE REFRACTORY CEMENTS

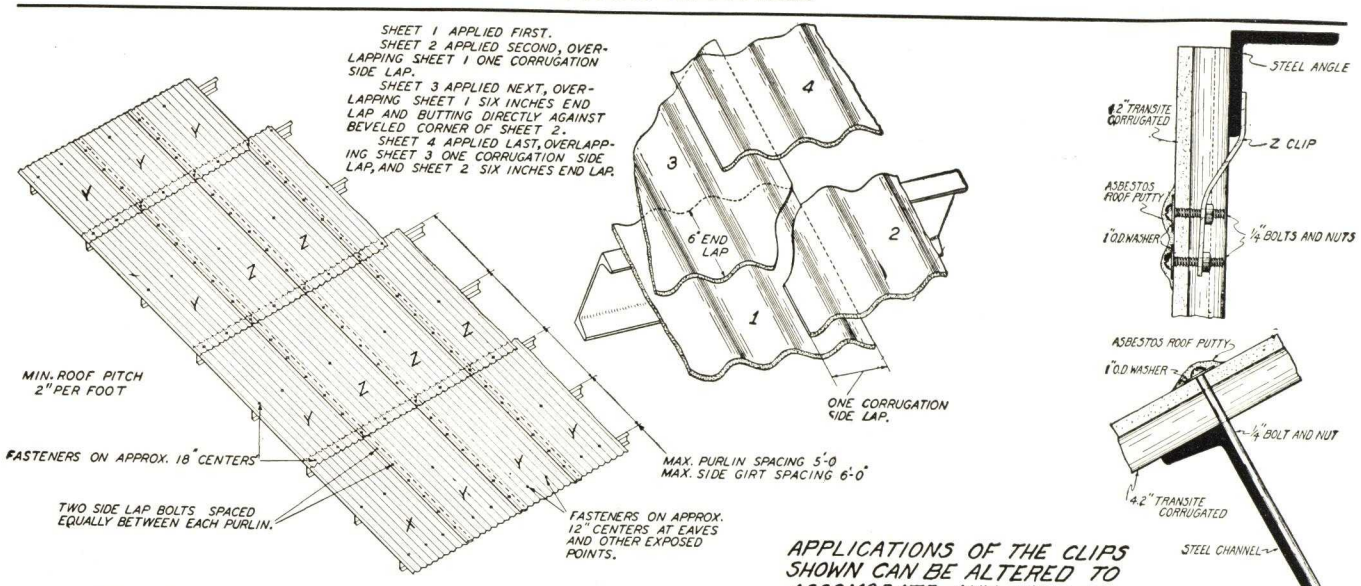
Character or base	No. 20 Silica	No. 26 Aluminum silicate	No. 29 Aluminum silicate	No. 30 Silicon carbide	No. 31 Aluminum silicate	No. 32 Aluminum silicate	No. 33 Processed Kaolin	No. 34 Chrome	No. 35 Processed high alumina	Firecrete Aluminum silicate	P. F. B. M. ‡ Aluminum silicate
Highest working temperature deg. F.	2750	2900	2900	3000	3100	3100	3300	3400	3500	2600	3100
Lowest working temperature deg. F.	Air setting	Partial air setting	Air setting	1450	1450	1250	1250	Partial air setting	1200	Hydraulic setting	1500
Pounds required for setting 1000 brick with ⅛-$\frac{3}{16}$-in. bond or cushion joint	.....	600–700	*	800	600–700	*	750†	**	750	**	†
Pounds required for setting 1000 brick with brick to brick or rubbed joint	400	.....	400*	.....	.....	400*	†	600**	.....	**	†
Form in which furnished	Ready-mixed	Dry	Ready-mixed	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Ready-mixed
Size containers	5, 10, 25, 50, 100, 250, 500, 850 lb. cans or drums	100 lb. bags	100, 240 485, 800 lb. drums	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100 lb. bags	100, 250 and 500 lb. drums

*For Wash Coating—Approximately 35 lb. of No. 29 mixed with 7 lb. of water per 100 sq. ft. Approximately 50 lb. of No. 32 mixed with 30 lb. of water per 100 sq. ft. Mix thoroughly and apply with a brush.

**For Monolithic Work—110 lb. of dry Firecrete required for 1 cu. ft. of construction. About 200 lb. of No. 34 required for 1 cu. ft. of construction.

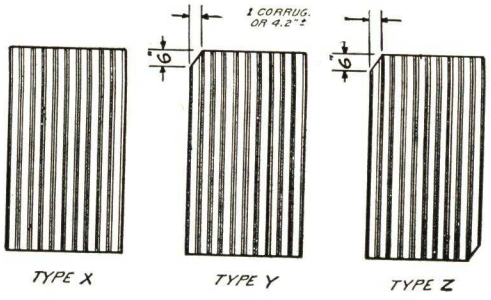
†For Patching—Approximately 125 lb. of P.F.B.M. required per cu. ft. About 130 lb. of No. 33 per cu. ft.

‡Plastic Fire Brick Material, abbreviated P.F.B.M., should be used in a very stiff condition.

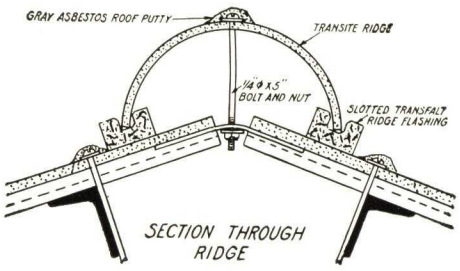

SHEET 1 APPLIED FIRST.
SHEET 2 APPLIED SECOND, OVERLAPPING SHEET 1 ONE CORRUGATION SIDE LAP.
SHEET 3 APPLIED NEXT, OVERLAPPING SHEET 1 SIX INCHES END LAP AND BUTTING DIRECTLY AGAINST BEVELED CORNER OF SHEET 2.
SHEET 4 APPLIED LAST, OVERLAPPING SHEET 3 ONE CORRUGATION SIDE LAP, AND SHEET 2 SIX INCHES END LAP.
4
3
2
1
6" END LAP
ONE CORRUGATION SIDE LAP.
MIN. ROOF PITCH 2" PER FOOT
FASTENERS ON APPROX. 18" CENTERS
TWO SIDE LAP BOLTS SPACED EQUALLY BETWEEN EACH PURLIN.
MAX. PURLIN SPACING 5'-0
MAX. SIDE GIRT SPACING 6'-0"
FASTENERS ON APPROX. 12" CENTERS AT EAVES AND OTHER EXPOSED POINTS.
STEEL ANGLE
4.2" TRANSITE CORRUGATED
Z CLIP
ASBESTOS ROOF PUTTY
1" O.D. WASHER
¼" BOLTS AND NUTS
ASBESTOS ROOF PUTTY
1" O.D. WASHER
¼" BOLT AND NUT
4.2" TRANSITE CORRUGATED
STEEL CHANNEL
J CLIP

STRAIGHT LAP LINE CONSTRUCTION WITH CUT-CORNER SHEETS

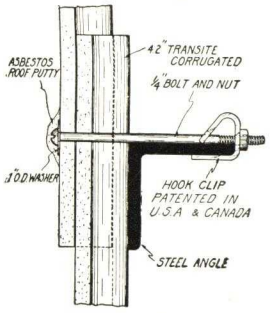
APPLICATIONS OF THE CLIPS SHOWN CAN BE ALTERED TO ACCOMODATE ANY TYPE OF CONSTRUCTION.

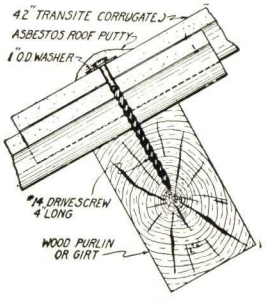


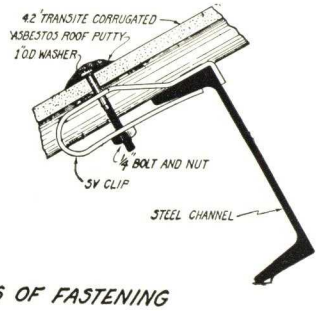
TYPES OF CUT-CORNER SHEETS



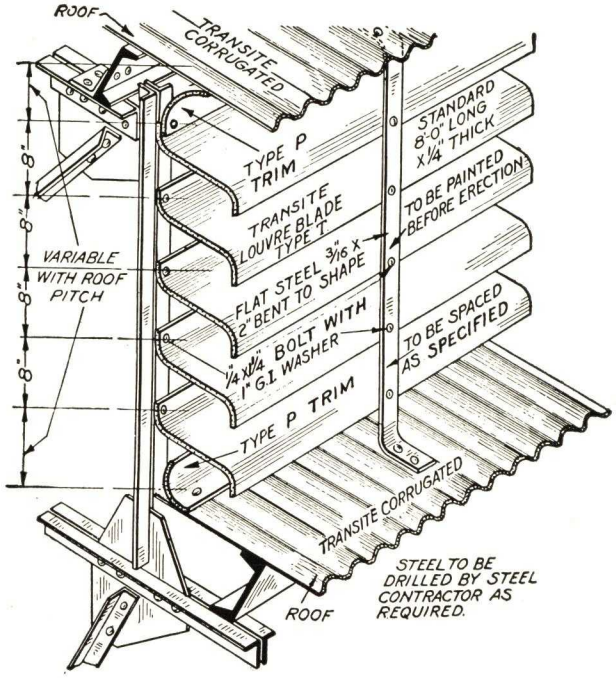
SECTION THROUGH RIDGE

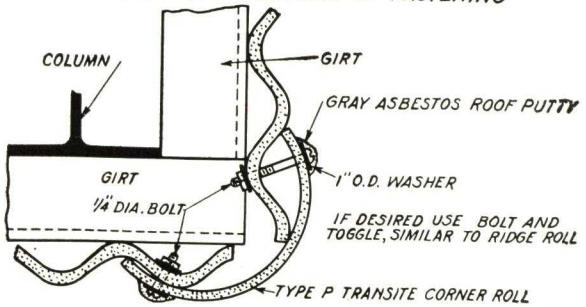






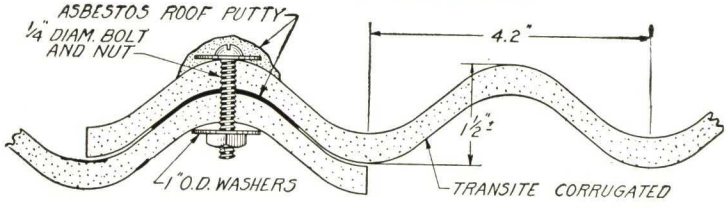
STANDARD METHODS OF FASTENING





SECTION SHOWING CORNER ROLL

TRANSITE LOUVRE CONSTRUCTION IS IDEALLY ADAPTED FOR MONITORS AND OTHER LOCATIONS WHERE ABUNDANT VENTILATION MUST BE COMBINED WITH MODERATE WEATHER PROTECTION



SIDE LAP CONSTRUCTION

CONSTRUCTION DETAILS FOR J-M CORRUGATED TRANSITE

JOHNS-MANVILLE CORRUGATED AND FLAT TRANSITE

J-M Transite products are composed of asbestos fibre and portland cement, combined under tremendous pressure into a homogeneous, dense mass of great strength and durability. Transite is light gray in color, weighs about 124 lb. per cu. ft., can be drilled with twist drills, punched, fastened with nails or screws and sawed with a hand saw, though a portable power saw should be used if much sawing is to be done. Transite will not burn, rot, corrode, shrink or otherwise deteriorate, and requires no painting or maintenance of any kind. It is made in different forms for various purposes.

Corrugated Transite Sheets

Corrugated Transite sheets are particularly designed for use as roofing and siding. Accurate cost records indicate that the use of this material assures longest building life and lowest per annum cost. The widespread utility of Transite in industrial plants is due to its high resistance to acid fumes, alkaline vapors and adverse atmospheric conditions as well as its strength, permanence, fireproof quality and ease of application.

In oil refineries it is used for fireproof aprons and roofs over stills, for housings of various types, and for "flare-back" walls around tanks to prevent spread of burning oil to adjacent tanks.

For railroads, it is an excellent material for switch towers, freight houses, way stations, and relay, battery and tool sheds. Also used successfully for pedestrian overpasses and smoke baffles, and particularly suited for roundhouses and car shops.

In the chemical and metallurgical industries, Transite solves difficult building problems, because of its comparative permanence where ordinary building materials are quickly destroyed. In gas and coke plants, electro-chemical industries, smelters, refineries, etc., Transite affords ideal construction because of its resistance to heat, steam and chemical fumes.

In mining and quarrying, Corrugated Transite is used as roofing and siding for hoist houses, loader and crusher sheds, storehouses and similar structures.

In many public utility and industrial plants where large quantities of coal are handled, Transite is the preferred material for coal conveyor housings.

Warehouses and docks, subjected to fire risks not only from the type of materials stored, but also the proximity of locomotives and ships, use thousands of square feet of Transite.

Garages and airplane hangars call for a fireproof, light-reflecting material which is easily erected on standard steel building frames and is neat and businesslike in appearance. The pleasing appearance and low cost of Transite waiting-rooms, terminals and hangars make it highly desirable for this purpose.

Because it is easily erected with minimum labor expense, requires no painting for preservation or appearance, and will outlive any other material used on open-frame construction, Transite roofing and siding is an asset for exposition or fair buildings which are used only intermittently.

Corrugated Transite sheets have corrugations with a 4.2-in. pitch and a depth of 1½ in., and are furnished 42 in. wide in lengths of 3, 3½, 3¾, 4, 4¼, 4½, 4¾, 5, 5¼, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½ and 11 feet. The thickness is approximately $\frac{7}{16}$ in. at ridge and valley of corrugations, and approximately $\frac{5}{16}$ in. on tangent. Weight approximately 4.1 lb. per sq. ft. uncrated, or 4.75 lb. per sq. ft. crated. Curved or special cut sheets can be furnished on special order.

Because of its unusual strength, Corrugated Transite can be laid on purlins spaced 60 in. and on girts spaced 72 in.

Corrugated Transite is also furnished in the form of ridge and corner rolls, and louvres. Details of construction, including design of corrosion-resisting fasteners, may be had on application to any Johns-Manville office.

The cut-corner construction is an important feature of Corrugated Transite sheets, which permits them to be laid with side laps in vertical lines. Type X sheet has all corners square; Type Y has one corner cut; and Type Z has two diagonal corners cut. The inside and outside radii of the corrugations are the same, insuring nesting at laps. Sheets can also be furnished with all corners square, for staggered joint construction.

Flat Transite Sheets

Transite in flat sheets is used as a casing over insulation on industrial furnaces and boilers; for ceilings, walls, panel work, partitions and fire doors in building construction; for arc barriers in electrical work where high dielectric strength is not required; and as dryer housings, hoods, dampers, baffles, and ducts in various industrial processes. It is also furnished made up into core plates, ducts, forge jacks, smoke jacks, etc.

Flat sheets are furnished 36x48 in. and 42x48 in., in thicknesses of ⅛ to 4 in., and 42x96 in., in thicknesses $\frac{3}{16}$ to 2 in. The special core plate material is furnished ¼, $\frac{5}{16}$, ⅜ and ½ in. thick in sheets 36x48 in., or in rectangular cut pieces.

W. R. Transite

Both Flat and Corrugated Transite sheets can be furnished with a bituminous impregnation to afford maximum impermeability where the material will be subjected to extreme or sustained moisture or acid conditions.

W. R. Flat Transite is furnished in standard size sheets, 42x96 in., ¼ in. thick; 42x48 in., ⅛, $\frac{3}{16}$ and ¼ in. thick; and 36x48 in., ⅛ and $\frac{3}{16}$ in. thick. Smaller sizes can be furnished on special order.

W. R. Corrugated Transite is furnished in the same size and thickness as the standard Corrugated Transite, up to and including lengths of 8½ ft.

Other Transite Products

Encased Insulating Board—Made up of ½ or 1-in. J-M Insulating Board, 42x96 in., with a ⅛-in. sheet of flat Transite cemented to each side. Used as a combination insulation and casing on dryers and ovens.

Transite Ventilators—Made from Transite Pipe which is described below. These ventilators are designed to give best possible air circulation on all buildings where fire-proof, fume-proof and weather-proof construction is desired. Sizes, 10 to 24 in. are shipped completely assembled. Larger sizes are shipped knocked down.

Transite Leaders and Gutters—Another development from Transite Pipe. Resistance to freezing and thawing and sudden temperature changes, fireproofness, and high resistance to corrosion are the features of these products. Connections and fittings are furnished as required. Circular leaders are supplied 2 to 6 in. in diameter. Semi-circular gutters are made in widths from 4 to 10 in.

Send for Brochure, Form TR-2A

JOHNS-MANVILLE TRANSITE PIPE

Transite Pipe, an asbestos and portland cement product, is built up under pressure to a uniform wall of dense, homogeneous structure with high strength and unusual ability to withstand destructive agencies.

Transite Pipe is manufactured by Johns-Manville under the process patents owned by Societa Anonima "Eternit" Pietra Artificiale, Genoa, Italy. This pipe has been manufactured and sold in Italy under the trade name "Eternit" for the past eighteen years.

CLASSES OF TRANSITE PIPE

Class	Working pressure lbs. per sq. in.	Equivalent head, ft. of water
F	0	0
S	0 to 21	50
A	43	100
B	86	200
C	130	300
D	173	400
E	217	500

Physical Properties

Transite Pipe is considerably lighter than other common water pipe of a corresponding size, even though the wall thickness of Transite Pipe is somewhat greater. It is highly resistant to external and internal corrosion, tuberculation, electrolysis and the reaction of many chemicals.

Tests have indicated that, because of its unusually smooth interior surface, Transite Pipe has 13% higher delivery capacity than most other forms of water pipe of the same diameter and under the same conditions of head and installation. Moreover, this smooth interior surface is maintained throughout the life of the pipe and is not reduced by tuberculation or corrosion.

Transite Pipe is non-combustible and, when used as a stack or vent to carry off the products of combustion, will fulfill the requirements without disintegrating, cracking or buckling. Its normal temperature limit is 700 deg. F.

Because of its low heat conductivity, Transite Pipe retards drop in flue gas temperature, which decreases condensation and improves draft.

14-in. Class C Transite Pressure Pipe Used as Water Main. Note Simplex Couplings

Uses of Transite Pipe

The following are typical applications of Transite Pipe, indicating the more common fields of usefulness:

Class F Pipe (Round or Oval)

Vents for domestic gas-burning appliances.
Flues and flue linings.
Vents for industrial furnaces.

Class S Pipe

Soil piping and sewer connections.
Fire protection for electric cables.
Low pressure water and process liquor lines.
Irrigation and drainage.
Stacks and vents for corrosive vapors.
Laboratory vent systems.
Hot air heating ducts.

Classes A, B, C, D, E (Pressure Pipe)

Water supply and distribution mains.
Sewer ejection lines.
Mine drainage and sluices.
Brine lines.
Process liquor lines.
Pure water lines for chemical plants.
Drainage and culverts.
Irrigation lines.
Large stacks.

Transite Pipe, fittings and accessories are available in sizes commonly required for the service intended.

JOHNS-MANVILLE ROOFING, SHINGLES AND ROOF INSULATION

To meet any roofing requirement, Johns-Manville supplies bonded built-up roofs, asbestos and asphalt shingles, ready-to-lay roofing, insulated and rot-proof roofs, roof insulation, and all necessary accessory materials. Corrugated Transite for roofing and siding is described on the preceding page.

For the past three years, much industrial equipment has been idle. To a marked degree, the wheels of industry have stopped turning. But machinery and internal plant equipment, when properly cared for, suffer practically no depreciation while in disuse.

Building exteriors, particularly roofs, are in a different category. They are constantly exposed to the weather and deteriorating influences are at work irrespective of the state of production.

It is here that immediate attention is demanded if a disproportionate future expense is to be avoided. A small expenditure now to make needful repairs to the roof will often save five to ten times the cost a few years hence. The additional advantage is that storm and weather are kept away from the building contents in the interim.

J-M Roof Survey Plan

For some time Johns-Manville has been organizing inspections and surveys to gather data on the effects of weather and water on roofs of different makes and lengths of service. The details of each inspection are incorporated in a report which is filed in the J-M District Office.

In many instances, these reports contain records of small defects which, unless promptly taken care of, are likely to become worse and cause serious damage. If these matters are remedied right away, this can be done for much less money than if the trouble is permitted to spread.

Copies of roof survey reports, where requested, are given to interested parties, and the services of the Johns-Manville roofing organization are made available to effect repairs. Many large concerns have been so impressed by the advantages to them of the J-M Roof Survey that they have asked for inspections and recommendations on all their roofs on buildings throughout the country.

While repair work and necessary maintenance constitute the usual roofing problems at the present time, new roofs and new constructions as developed by Johns-Manville are discussed in the following paragraphs. These materials and methods form the basis of scientific roof building and repair.

J-M Bonded Built-up Roofs

Realizing that no one type of built-up roof can satisfy all conditions, Johns-Manville has developed a number of styles of built-up roofs, each of which is designed to meet certain definite requirements.

J-M Bonded Built-up Roofs are constructed of successive layers of saturated roofing felts, alternated with layers of roofing asphalt or pitch. The kind of felt used, either asbestos or rag, and the number of layers, vary with the different types of roofs. The final surfacing also varies, being either a smooth-surfaced coating, slag or gravel, or felt with a colored crushed slate surface.

Protected by National Surety Co. Bond—To the security indicated by its own reputation, Johns-Manville adds a bond of the largest surety company in the United States, insuring fulfillment of its promise of trouble-free roofs to purchasers. Where J-M specifications are followed as to flashings, a flashing endorsement is part of the bond.

Guarantee bonds on J-M Built-up Roofs cover periods of 10, 15 or 20 years, depending upon the kind, weight and number of plies of felt, the type and pitch of roof deck and character of service.

J-M Smooth-surfaced Asbestos Built-up Roofs—The outcome of several decades of study and experience in producing durable, fireproof, weather-proof, light-weight roofs at a moderate cost. These roofs are approved by the National Board of Fire Underwriters and carry base rates of insurance. They are suitable for practically every type of industrial building, warehouse, office building, hotel, hospital and apartment house.

J-M Super Class A Roofs consist of a 60-lb. asbestos base felt and three plies of 20-lb. asphalt-saturated asbestos finishing felt, surfaced with an asphaltic coating. Over wood decks, this roof carries a 20-year bond.

J-M Class A Roofs differ from the Super Class A Roofs in that only two plies of finishing felt are used. Class A Roofs over non-combustible decks are bonded for 20 years; over wood decks, for 15 years.

Class A Roofs, with the introduction of a strong waterproofing fabric between the base and finishing felts, are ideally suited to the severe service encountered on spray decks. These special spray deck roofs are bonded for 10 years.

All-asbestos roofs over rigid insulation call for three or four shingled plies of 20-lb. asbestos felt, bonded for 15 and 20 years, respectively.

Gravel or Slag-surfaced Asbestos Built-up Roofs—Plies of 15-lb. tar-saturated asbestos felts with moppings of coal tar pitch. These roofs are bonded for 10, 15 or 20 years, depending upon type and slope of roof deck and number of plies of felt.

Combination Asbestos Felt and Rag Felt Built-up Roofs—Composed of an asphalt-saturated rag base felt followed by two plies of 20-lb. asphalt-saturated asbestos finishing felts and a smooth asphaltic roof coating. These roofs are bonded for 15 or 10 years, depending upon whether a 45-lb. or a 30-lb. rag base felt is used.

Rag or Tar Felt Built-up Roofs—Alternating layers of 15-lb. asphalt-saturated rag felts and roofing asphalt or pitch with various surfaces. The top surface of such roofs consists of gravel (maximum pitch 2 in. per ft.), or slag (maximum pitch 4 in.), or of a layer of J-M Split Sheet Slatekote (maximum pitch 9 in.). Slatekote is a heavy asphalt-saturated rag felt into which a coating of crushed slate is securely embedded at the factory. An ornamental surface can be obtained by the use of Slatekote which may be had in red, green or blue-black as standard colors and in white or chrome orange for airport construction. Bonds on these rag felt roofs are for 10, 15 or 20 years.

Applied by Approved Roofers—Proper application is just as important in producing a J-M Built-up Roof as are the materials themselves. Regardless of careful selection and manufacture, all roofing materials must be laid in accordance with specifications based on seasoned experience.

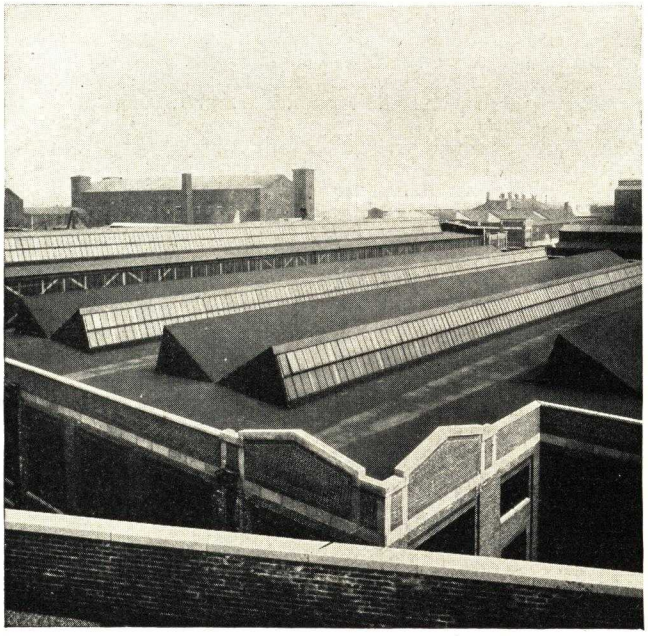
For this reason, in every community J-M Approved Roofers have been selected by Johns-Manville as qualifying in roofing experience and business integrity to carry the J-M franchise in applying built-up roofs. A J-M roof expert inspects every bonded job and passes on the workmanship and attention to detail. After roofs are in place, these experts are available for return inspections to remedy any unforeseen trouble before it reaches a serious stage—practical life extension for the roof.

J-M Roof Insulation

J-M Rigid Roofinsul is a strong insulating board made of felted wood fibres. It has a high insulating value, is extremely resistant to moisture absorption, and is economical and easy to apply. Installed in connection with a J-M Built-up Roof, it is an ideal insulation for any type of roof deck subjected to ordinary conditions. Furnished 24x48 in. in standard thickness of ½ in. For greater thicknesses, two or more sheets are furnished stapled together with a ¾-in. ship-lap on all four edges.

Where interior humidity is especially high and roof drip must be eliminated, as in a paper machine room, the special patented roof construction known as J-M Insulated Rot-proof Roof is recommended. In this construction, cork insulation is built-up over Corrugated W. R. Transite and the whole protected by a J-M Built-up Roof.

For description of Transite as a roofing and siding material, see page 9.



J-M Super Class A Built-up Roof on the Plant of John A. Roebling's Sons Co., Roebling, N. J.

Ready-to-Lay Roofing

In ready-to-lay roofings, Johns-Manville supplies both asbestos felts and rag felts, with plain or slate-embedded surfaces. They are inexpensive and well suited for uses where roll roofings are adaptable.

Asbestos and Asphalt Shingles

J-M Asbestos Shingles—Made of asbestos fibre and portland cement. Provide a weather-proof, permanent, fireproof roof, which is economical and capable of being designed to harmonize with any architectural style or color scheme.

J-M Slatekote Shingles—Made of rag felt and asphalt, with many different surface colors of crushed slate. Durable, weather-tight, inexpensive and present an attractive appearance.

Send for Data Sheets

JOHNS-MANVILLE FLOORING MATERIALS

For many years, J-M Industrial Flooring was the standard top-flooring for industrial work. This mastic type floor has now been partially displaced where there is no objection to a non-monolithic floor or where there is a preference for flooring which may be put down in individual units, like J-M Industrial Flooring Plank.

J-M Industrial Flooring Plank

J-M Industrial Flooring Plank is manufactured from selected asphalts, fibres and fillers which are compressed into rectangular planks 12x12 in. and 12x24 in., in ¼, ⅜ and ½-in. thicknesses. Three colors are available—red, brown and black.

The plank is quiet, dustless, fire-retardant, vermin-proof and odorless and will not check, chip, warp or decay. It possesses considerable resilience and is capable of supporting heavy loads, but has no grain and therefore will not splinter.

Industrial Flooring Plank is rapidly and easily applied and is ready for use as soon as it is laid. Should any part of the floor be seriously injured through accident, the damaged planks are quickly replaced and the repaired section is ready for traffic immediately.

It is recommended for use on warehouse or manufacturing floors where a suitable base or sub-floor exists and where heavy static loads are not resting on small bearing areas. In such installations as shoe factories, loading platforms, transfer platforms, freight house floors and trucking aisles, Industrial Flooring Plank stands up under the extremes of light hand trucking and severe motor trucking. Aside from some stiffening effect, the plank does not impart structural strength. The sub-floor must be plane and level and support the specified load. The plank is laid in J-M Asphalt Plank Cement.

J-M Industrial Flooring (Mastic)

J-M Industrial Flooring, a durable, resilient, black asphaltic concrete, is particularly adapted to the varied needs of industry. Heavy foot or wheel traffic or shock from dropped heavy objects does not injure the smooth, waterproof, dustless surface of J-M Industrial Flooring. It is odorless, sanitary and practically wear-proof.

This tough top flooring has proved eminently satisfactory in warehouses, machine shops, freight houses, public buildings, laboratories, locker rooms, corridors, composing rooms and in miscellaneous industrial plants where strength or chemical-resisting properties are vital. It can be laid over any substantial sub-floor such as concrete, brick, tile or wood, which is, of itself, strong enough to carry the floor load.

Because it is noiseless, non-slip, vermin-proof and fire-retardant, J-M Industrial Flooring is widely used for new structures, but serves equally well laid over worn or uneven floors of wood, concrete or other material. The sub-floor is thereby preserved, and the monolithic top flooring stands up under rough usage.

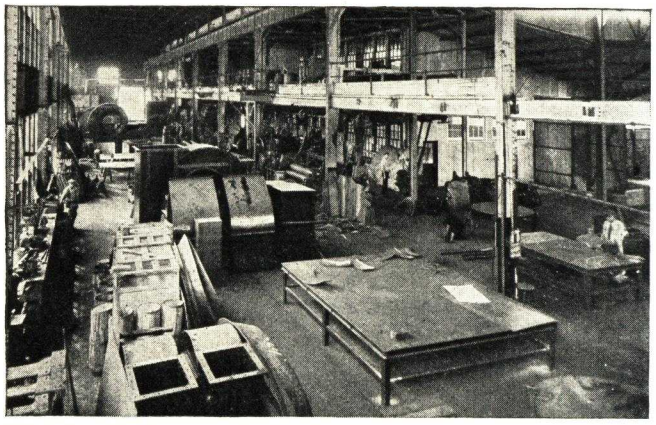
Plant processes and production are not materially interrupted by laying J-M Industrial Flooring, since the floor can be used as soon as the material has cooled, a matter of a few hours. It is laid in thicknesses from ¾ in. to 3 in., depending on traffic requirements.

J-M Asphalt Tile Flooring, Type A

J-M Asphalt Tile Flooring is a decorative flooring, manufactured as a flat tile in twelve plain colors: black, red, mahogany, tan, gray, verte blue, ivy green, apple green, olive green, terra cotta, buff and rose taupe. Marbleized color combinations in attractive variety can be furnished on special order. This tile is used extensively in schools, office buildings, churches, hospitals, stores, theatres, clubs, restaurants and libraries.

J-M Asphalt Tile Flooring is odorless, waterproof and does not originate dust. It is comfortable under foot, non-slippery, and approved for use in fireproof structures.

Under the ordinary foot traffic to be found in buildings, the 3/16-in. tile is extremely durable, and improves in appearance with use. Standard tile are furnished in the following sizes: 3x3 in. and 3x6 in. in 3/16-in. thickness only; 6x6 in., 6x12 in., 9x9 in., 12x12 in. and 12x24 in. in both 3/16 and ⅛-in .thicknesses.



J-M Industrial Flooring in Service Five Years at Greene Fuel Economizer Plant, Matteawan, N. Y., and Still in Excellent Condition

Standard borders are supplied of the same material, in black and in mahogany, 9x27x⅛ or 3/16 in., 12x36x3/16 in. and 18x24x⅛ or 3/16 in. Other colors, in these sizes, available on special order.

Borders can also be furnished 9x18 in., in thicknesses of both ⅛ and 3/16 in., but no stock is carried of this size.

Send for Data Sheets BMF-1 to 80; also Tile Flooring Brochures

JOHNS-MANVILLE WATERPROOFING AND DAMP-PROOFING

Johns-Manville furnishes a complete line of asphalt-impregnated waterproofing felts and fabrics, and plastic waterproofing and damp-proofing compounds.

Membrane Waterproofing—A treatment designed to render concrete and masonry structures impervious to water, more commonly where hydrostatic pressure exists. A protective skin is built up of bituminous materials reinforced with felted or woven fabrics which completely surround or overlay the waterproofed structure. All plies are thoroughly coated with bitumen, and bonded together and to the concrete. The treatment is usually applied on the outside of the structure so that the water pressure has a tendency to keep it in place. If applied on the inside, it is usually necessary to overlay the treatment with concrete.

J-M Waterproofing on the Niagara River Bridge of the Michigan Central R. R.

J-M membranes, built-up of asbestos felts and fabrics in combination, have the qualities of permanence, strength and flexibility. J-M Asbestos Waterproofing Felts have greater resistance to water than either asphalt-saturated rag felts or cotton fabrics and are preferably used as the outer reinforcing agents in waterproofing membranes. Cotton fabric is used primarily for its tensile strength and, when specified, is placed in the center of the membrane. In this position no water can reach it and it is protected from mold and bacterial action.

The bituminous material used is J-M Standard Asphalt Waterproofing Cement, carefully manufactured from selected asphaltic crude of great purity which is especially adapted to waterproofing work.

Damp-proofing—A protection against the penetration of moisture by absorption and capillary action. This method is used both above and below ground level, but its primary purpose is to prevent staining of brick, stone, concrete and interior plastering. Damp-proofing is ordinarily accomplished by bituminous surface coatings, used without reinforcing materials.

Detailed information on waterproofing and damp-proofing is available on application to Johns-Manville. J-M waterproofing and damp-proofing materials are supplied to contractors with full directions for application.

Send for Data Sheets BMW-1 to 5; also Brochure on Preformed Expansion Joints and Asphalt Bridge Plank, Form EX-4A; and "Safeguarding Your Pipe Line Investment" (underground pipe protection), Form OI-1A

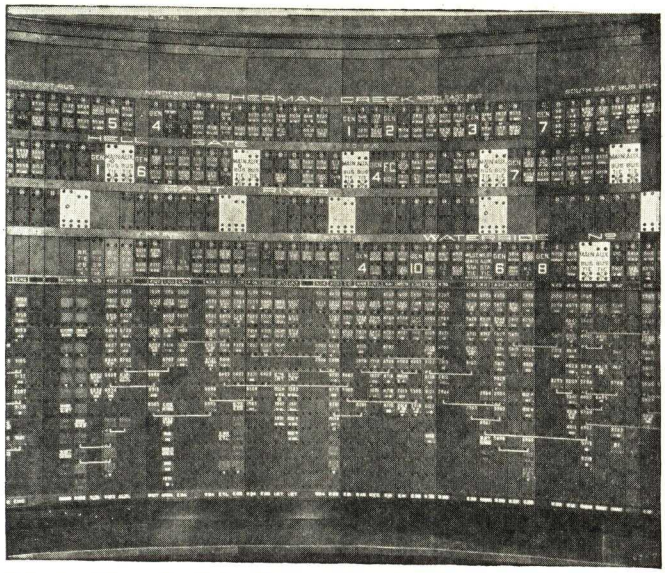
JOHNS-MANVILLE ELECTRICAL MATERIALS

In the electrical field J-M materials have met with satisfaction for more than a generation. Some of the more universally used products are briefly described below. Information in greater detail concerning them and other items in the J-M line will be promptly furnished by any Johns-Manville office.

Asbestos Ebony—A densely pressed sheet of asbestos fibre and binding cement, impregnated with an insulating compound, used for switchboards, controller plates, switch bases, etc. Has high dielectric strength, insulation resistance, mechanical strength and durability. Sheets are furnished 36x48 in. from ⅛ to 4 in. thick; 42x48 in. and 42x96 in. from ¼ to 4 in. thick, or finished panels of any size within these limits.

Asbestos Ebony Moulded—Similar to Asbestos Ebony sheets but moulded in special shapes, with holes, counterbores, slots or grooves, as required. Used principally where small panels are required for switches, starters, meters, etc. Panels can be furnished in thicknesses from ¼ to 1½ in. and in sizes to 20x25 in.

Electrobestos—A heat-resistant densely moulded material composed of asbestos fibre, high temperature clays and binding cement. Used for arc deflectors, induction furnace bushings and for heater or oven parts, heater cores, etc., where temperature does not exceed 1200 deg. F. Moulded to order in sheets 30x30 in., ¼ to 1 in. thick; panels from ¼ to 1½ in. thick in



Asbestos Ebony Used for Systems Operating Board in the Waterside Station of the New York Edison Co.

sizes to 20x25 in. Also furnished in various special forms such as cable protectors, lehr rolls and stove pipe insulators.

Friction Tapes—Cotton sheeting impregnated with an insulating compound and coated with a high grade adhesive rubber composition, used for covering wire joints. J-M brands are: Jomanco, No. 3, A.S.T.M., No. 5, J-M Friction, and J-M White Tape. Furnished in standard friction tape widths.

Niagrite-Asbestoment Cable Fireproofing—Commercially pure asbestos tape (Niagrite) with or without reinforcement, is impregnated with Asbestoment and wrapped on electrical cables to form a fireproof, arc-proof protection. Niagrite is furnished in widths of 1½, 2 and 3 in., in thicknesses of 3/32, ⅛, 5/32 and ¼ in., and in rolls of 15 ft. Special "B" Niagrite (reinforced with jute cloth) is most generally used.

Orangeburg Fibre Conduit (Made by The Fibre Conduit Co., Orangeburg, N. Y.)—Impregnated tubular ducts, made of macerated wood pulp formed on a mandrel, dried and densely impregnated with pitch. Used extensively as an underground ductway for power cables, telephone and signal lines. Furnished in 5-ft. and 8-ft. lengths. Standard diameters are from 1 to 6 in. Larger sizes on special order. Bends, elbows, crosses, tees, etc., are also supplied.

Transite—Transite, described on page 9, is used in the electrical industry for cell structures and in the construction of many types of electrical apparatus.

Send for Brochure on Orangeburg Fibre Conduit, Form EL-4A

JOHNS-MANVILLE INDUSTRIAL FRICTION MATERIALS

Johns-Manville has served industry for many years with a complete line of dependable friction materials. These products have established new records for economies in power and maintenance when applied to hoists, winches, shovels, draglines, aerial tramways, inclined planes, cranes, and other equipment used in industry. Their production requires an experienced force of technicians and workmen, a thoroughly equipped laboratory for research and tremendous manufacturing facilities.

J-M Industrial Friction Materials are of both the rigid and flexible types. The rigid types, which include J-M Asbesto-Metallic Friction Blocks and J-M Moulded Friction Lining, are noted for their strength, uniformity of friction, smooth and quiet operation and long life on severe work in the low or average speed range. The flexible types wear well on light loads with high speed, have high friction and are more adaptable to all sizes of drums. Both types possess to an unusual degree the three fundamentals required of friction material in industry—heat resistance, mechanical strength and durability.

J-M Folded and Compressed Lining, Type 600 (flexible)—The best general utility lining yet to be offered to industry. It is a readily-formed, strong material that is adaptable to average speed, shock load conditions. It will resist temperatures up to 600 deg. F. very satisfactorily and the frictional value stays within reasonable limits through a wide range of temperature. The rate of wear is remarkably low, considerably below that of either woven or moulded materials.

Type 600 has a wide range of application and is unexcelled for field replacement, especially on worn drums. This lining is manufactured of asbestos cloth woven from brass wire-inserted yarns. Cloth is coated both sides with a heat-resisting compound, folded to required size, hydraulically pressed and cured by heat.

J-M Asbesto-Metallic Friction Blocks, Types 100 and 120 (rigid)—Made from asbestos, brass wire and rubber composition, hydraulically formed in a mould and cured by heat and pressure to the required shape. The difference between the types lies primarily in their friction value which is modified by changing the composition of the block, chiefly by adding graphite.

J-M Moulded Friction Lining, Types 200 and 220 (rigid)—Practically the same composition as Asbesto-Metallic Friction Blocks. However, the material is readily adaptable to wrap bands, either internal or external. The difference in type lies primarily in friction value.

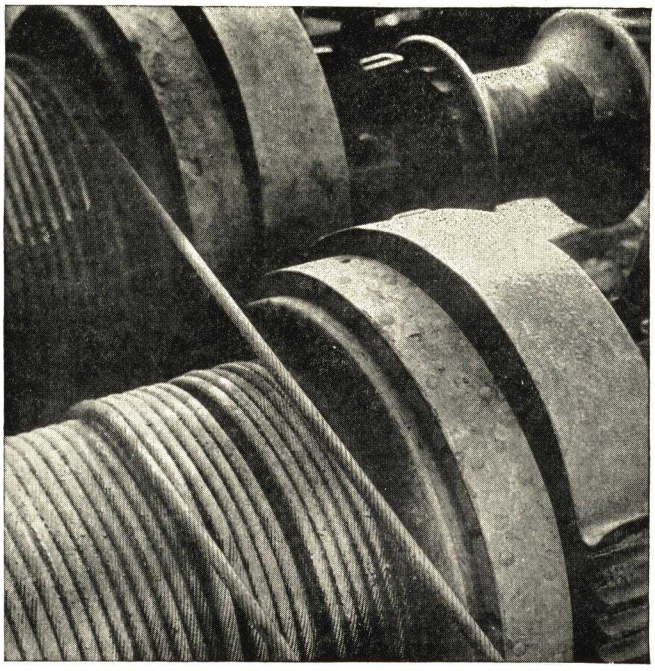
The above rigid materials, because of their high mechanical strength, are particularly adaptable to low or average speed and severe shock service where there is a tendency to crush or shear the friction material due to sudden application of heavy loads. Where temperature is a factor, these materials should always be used as they are very high in heat resistance and have a remarkably constant coefficient of friction at varying temperatures.

Types 100 and 200 are most satisfactory for cast iron surfaces. Types 120 and 220 are more applicable to steel friction surfaces as they have less scoring tendency on steel. Sketches and accurate dimensions are necessary when ordering rigid materials.

Other J-M Friction Materials—Johns-Manville has a complete line of Woven Brake Linings that are designed for dry, limited-oil, or full-oil service, for low or high temperature and for light or severe loading.

Clutch facings for both cone and disc type clutches can be furnished from any of the above mentioned materials.

The Johns-Manville friction material recommendation chart, appearing in Brochure, Form FM-1A, will be sent on request. Technical assistance and engineering service on friction material problems is available through any J-M office.



J-M Friction Materials Give Long and Satisfactory Service

Complete Information Concerning J-M Products May Be Had at Any Johns-Manville Office

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